CLAIMS

What is claimed is:

1. An apparatus comprising:

a coarse timing synchronization element to generate a coarse timing signal from at least one of a plurality of first training symbols, the coarse timing signal indicating detection of a packet; and

a fine timing synchronization element responsive to the coarse timing signal to generate a fine timing signal from at least one of a plurality of second training symbols, the fine timing signal to initiate data symbol processing.

2. The apparatus of claim 1 wherein the coarse timing signal indicates detection of an orthogonal frequency division multiplexed (OFDM) packet, and the fine timing signal initiates channel estimation,

and wherein the apparatus is a receiver to receive the OFDM packet.

3. The apparatus of claim 1 wherein the coarse timing synchronization element includes a first training symbol matched filter substantially matched to the first training symbols, the first training symbol matched filter responsive to an initial packet detection signal, and

wherein the first training symbols are comprised of a known first training signal, and wherein the first training symbol matched filter samples the at least one of the first training symbols over first sampling intervals and correlates the sampled first training symbols with first matched filter coefficients, the first matched filter coefficients being complex conjugates of the known first training signal.

4. The apparatus of claim 3 wherein the first training symbol matched filter samples the at least one of the first training symbols during a first training symbol window beginning after several of the first training symbols following receipt of

the initial packet detection signal, the first training symbol window being approximately a duration of one of the first training symbols.

5. The apparatus of claim 3 wherein the coarse timing synchronization element includes a first symbol combiner and a first symbol threshold element, the first symbol combiner to combine correlation outputs from the first training symbol matched filter for at least some of the first training symbols, and wherein the threshold device to generate the coarse timing signal if an output of the combiner exceeds a predetermined coarse timing threshold.

6. The apparatus of claim 1 wherein the fine timing synchronization element includes a second training symbol matched filter substantially matched to the second training symbols, the second training symbol matched filter responsive to the coarse-timing signal, and

wherein the second training symbols are comprised of a known second training signal, and wherein the second training symbol matched filter samples at least some of the second training symbols over second sampling intervals and correlates the sampled second training symbols with second matched filter coefficients, the second matched filter coefficients being complex conjugates of the known second training signal.

7. The apparatus of claim 6 wherein the second training symbol matched filter samples at least some of the second training symbols during a second training symbol window beginning after a predetermined number of the second training symbols following the coarse timing signal, the second training symbol window being approximately a duration of one of the second training symbols.

8. The apparatus of claim 6 wherein the fine timing synchronization element includes a second symbol combiner and a second symbol threshold element, the second symbol combiner to combine correlation outputs from the second training symbol matched filter for at least some of the second training symbols, and wherein the second symbol threshold device to generate the fine

timing signal when an output of the second symbol combiner exceeds a predetermined fine timing threshold.

9. The apparatus of claim 2 wherein the fine timing signal indicates approximately a beginning of data symbols of the OFDM packet, and

wherein the receiver further comprises a Fast Fourier Transform (FFT) element to perform an FFT on the data symbols in response to receipt of the fine timing signal, and

wherein the FFT element has an FFT duration over which the FFT is performed, and wherein the first training symbols are approximately a quarter of the FFT duration, and the second training symbols are approximately equal to the FFT duration.

10. The apparatus of claim 1 wherein the fine timing signal indicates approximately an end of the second training symbols, and wherein the receiver further comprises a Fast Fourier Transform (FFT) element to perform an FFT on the second training symbols to estimate a channel transfer function in response to receipt of the fine timing signal.

11. The apparatus of claim 10 wherein the FFT element has an FFT duration over which the FFT is performed, and wherein the first training symbols are approximately a quarter of the FFT duration, and the second training symbols are approximately equal to the FFT duration.

12. The apparatus of claim 1 further comprising an RF receive unit to generate a plurality of OFDM symbols from a received OFDM signal, the OFDM symbols comprising the plurality of first training symbols followed by the plurality of second training symbols and data symbols.

13. The apparatus of claim 1 further comprising an autocorrelating element to preliminary detect the OFDM packet by correlating at least one of the first

training symbols with a next of the first training symbols and generate an initial packet detection signal.

14. The apparatus of claim 13 wherein the autocorrelating element performs an autocorrelation with a time-moving average to preliminary detect the OFDM packet and generate the initial packet detection signal, and

the autocorrelating element to generate a coarse frequency offset (CFO) estimate using a time-moving average of several of the first training symbols, the autocorrelating element to further generate a signal power estimate using a time-moving average of at least some of the first training signals, the signal power estimate being used for automatic gain control.

15. The apparatus of claim 1 wherein the first training symbols are short training symbols, and the second training symbols are long training symbols having a duration of approximately four times that of the short training symbols, the long training symbols having a duration of approximately 4 microseconds.

16. A method to detect and synchronize with a symbol boundary of OFDM packet comprising:

generating a coarse timing signal from at least one of a plurality of short training symbols, the coarse timing signal indicating detection of an orthogonal frequency division multiplexed (OFDM) packet; and

generating, in responsive to the coarse timing signal, a fine timing signal from at least one of a plurality of long training symbols, the fine timing signal to initiate data symbol processing and channel estimation.

17. The method of claim 16 wherein the short training symbols are comprised of a known short training signal, and wherein the method further comprises:

sampling, in response to an initial packet detection signal, at least one of the short training symbols over short sampling intervals; and

correlating the sampled short training symbols with short matched filter coefficients, the short matched filter coefficients being complex conjugates of the known short training signal.

18. The method of claim 17 wherein sampling further comprises sampling the at least one of the short training symbols with a short training symbol matched filter during a short training symbol window beginning after several of the short training symbols following receipt of the initial packet detection signal, the short training symbol window being approximately a duration of one of the short training symbols; and

combining correlation outputs from the short training symbol matched filter for at least some of the short training symbols; and

generating the coarse timing signal when a correlation output exceeds a predetermined coarse timing threshold.

19. The method of claim 16 the long training symbols are comprised of a known long training signal, and wherein the method further comprises:

sampling, in response to receipt of the coarse-timing signal with a long training symbol matched filter, at least some of the long training symbols over long sampling intervals; and

correlating the sampled long training symbols with long matched filter coefficients, the long matched filter coefficients being complex conjugates of the known long training signal,

wherein sampling comprises sampling at least some of the long training symbols during a long training symbol window beginning after a predetermined number of the long training symbols following the coarse timing signal, the long training symbol window being approximately a duration of one of the long training symbols,

and wherein correlating comprises combining correlation outputs from the long training symbol matched filter for at least some of the long training symbols, and generating the fine timing signal when an output of the long symbol combiner exceeds a predetermined fine timing threshold.

20. The method of claim 16 wherein the fine timing signal indicates approximately a beginning of data symbols of the OFDM packet, and wherein the method further comprises:

performing a Fast Fourier Transform (FFT) on the data symbols in response to receipt of the fine timing signal.

21. The method of claim 16 wherein the fine timing signal indicates approximately an end of the long training symbols, and wherein the method further comprises:

performing a Fast Fourier Transform (FFT) on at least some of the long training symbols in response to receipt of the fine timing signal to estimate a channel transfer function.

22. A method comprising:

auto-correlating a received signal to initially detect a packet, the packet preceded by a preamble comprised of a plurality of first training symbols and a plurality of second training symbols;

performing a timing synchronization using at least one of the first training symbols and at least one of the second training symbols; and

initiating data symbol processing and channel estimation in response to the timing synchronization.

23. The method of claim 22 wherein auto-correlating comprising auto-correlating a received orthogonal frequency division multiplexed (OFDM) signal to initially detect an OFDM packet, and wherein the first training symbols are short OFDM training symbols, and the second training symbols are long OFDM training symbols, and

wherein performing the timing synchronization comprises:

performing a coarse timing synchronization in response to initial detection of the packet using at least some of the short training symbols; and

performing a fine timing synchronization in response to the coarse timing synchronization using at least some of the long training symbols.

24. The method of claim 23 wherein auto-correlating comprises correlating one of the short symbols with a next short symbol to detected the packet when a correlation magnitude exceeds a predetermined threshold, and wherein the method further comprises:

performing a coarse frequency offset (CFO) estimation and a signal power estimation during a first portion of the short training symbols to adjust, respectively, a VCO element and an AGC element of a receiver, and wherein

performing the coarse timing synchronization correlates the at least some of the short training symbols with a first symbol matched filter matched to one of the short training symbols, and performing the fine timing synchronization correlates the at least some of the long training symbols with a second symbol matched filter matched to one of the long training symbols.

25. An orthogonal frequency division multiplex (OFDM) receiver system comprising:

a dipole antenna to receive signals that include an OFDM packet

a first symbol matched filter to coarsely detect a symbol boundary of the OFDM packet by correlating short training symbols;

a second symbol matched filter to finely detect the symbol boundary by correlating long training symbols; and

a data symbol-processing element to perform a channel estimation and to perform data symbol processing on the OFDM packet in response to fine packet detection by the second symbol matched filter.

26. The receiver system of claim 25 further comprising:

a first combiner to combine correlation outputs from the first symbol matched filter;

a second combiner to combine correlation outputs from the second symbol matched filter; and

a autocorrelation element to initially detect the OFDM packet with an autocorrelation processes using at least some of the short training symbols.

27. The receiver system of claim 25 wherein:

the short training symbols are comprised of a known short training signal, and wherein the short training symbol matched filter samples the at least one of the short training symbols over short sampling intervals and correlates the sampled short training symbols with short matched filter coefficients, the short matched filter coefficients being complex conjugates of the known short training signal, and wherein the short training symbol matched filter samples the at least one of the short training symbols during a short training symbol window beginning after several of the short training symbols following receipt of an initial packet detection signal, the short training symbol window being approximately a duration of one of the short training symbols, and

wherein the long training symbols are comprised of a known long training signal, and wherein a long training symbol matched filter samples at least some of the long training symbols over long sampling intervals and correlates the sampled long training symbols with long matched filter coefficients, the long matched filter coefficients being complex conjugates of the known long training signal, and wherein the long training symbol matched filter samples at least some of the long training symbols during a long training symbol window beginning after a predetermined number of the long training symbols following the coarse timing signal, the long training symbol window being approximately a duration of one of the long training symbols.

28. An article comprising a storage medium having stored thereon instructions, that when executed by a computing platform, result in:

a synchronization of an orthogonal frequency division multiplexed (OFDM) packet;

a generation of a coarse timing signal from at least one of a plurality of short training symbols, the coarse timing signal indicating detection of an orthogonal frequency division multiplexed (OFDM) packet; and

a generation of a fine timing signal, in responsive to the coarse timing signal, from at least one of a plurality of long training symbols, the fine timing signal to initiate data symbol processing and channel estimation.

29. The article of claim 28 wherein the short training symbols are comprised of a known short training signal, and wherein the instructions further result in:

a sampling, in response to an initial packet detection signal, at least one of the short training symbols over short sampling intervals; and

a correlation of the sampled short training symbols with short matched filter coefficients, the short matched filter coefficients being complex conjugates of the known short training signal.

30. The article of claim 29 wherein the sampling further comprises a sampling of the at least one of the short training symbols with a short training symbol matched filter during a short training symbol window beginning after several of the short training symbols following receipt of the initial packet detection signal, the short training symbol window being approximately a duration of one of the short training symbols;

a combination of correlation outputs from the short training symbol matched filter for at least some of the short training symbols; and

a generation of the coarse-timing signal when a correlation output exceeds a predetermined coarse-timing threshold.